

## PHYSICAL TRAINING APPARATUS

### FIELD OF THE INVENTION

This invention relates to physical training machines and apparatus and more particularly to apparatus for developing and testing the strength and  
5 technique of athletes.

For the sake of convenience, the invention will be described in relation to the use of the apparatus in developing the strength and technique of forward players in the sport of rugby union football but it is to be understood that the invention is not limited thereto as it will find application in other sports and  
10 activities.

### BACKGROUND ART

Hitherto, physical training machines for developing the technique of forward players in the sport of rugby union football consist of a ground engaging carriage which carries spaced apart pads against which the players  
15 push with resistance to the push being created by the contact of the carriage with the ground. A disadvantage of such scrum training machines is that they do not develop muscular strength or simulate the dynamic forces encountered in a rugby scrum.

There is a need for a physical training machine which provides  
20 measured resistance in a horizontal plane to simulate effectively the body position and dynamic forces encountered in a rugby scrum and thus develop the requisite specific muscular strength.

There is also a need for a physical training machine which simulates the muscle contraction and extension provided by the squat exercise but which  
25 provides for variable and increasing resistance as the athlete moves from deep contraction of the knee and hip joints to full extension of those joints.

SUMMARY OF THE INVENTION

According to one aspect of the invention there is provided a physical training apparatus comprising a main frame having a base, a front portion and a back portion having an upright portion spaced from the front portion, a moveable carriage slidable with respect to the front portion of the main frame, a cable connected by one of its ends to the carriage and extending from the front portion of the base to the upright portion, a weight pivotally mounted on the upright portion connected to the other end of the cable and positioned above the base of the main frame rearward of the front portion, the arrangement being such that a driving force on the carriage causes the weight to rise thereby providing resistance to the driving force on the carriage.

BRIEF DESCRIPTION OF THE DRAWINGS

- Fig. 1 is a front perspective view of a physical training apparatus according to one embodiment of the invention,
- 15 Fig. 2 is a rear perspective view of the physical training apparatus shown in Fig. 1,
- Fig. 3 is a side elevational view of the physical training apparatus shown in Figs. 1 and 2,
- 20 Fig. 4 is a underneath plan view of the physical training apparatus shown in Figs. 1 and 2,
- Fig. 5 is a top plan view of the physical training apparatus shown in Figs. 1 and 2,
- Fig. 6 is a front elevational view of the physical training apparatus shown in Figs. 1 and 2,
- 25 Fig. 7 is a rear elevational view of the physical training apparatus shown in Figs. 1 and 2,

Fig. 8 is a side elevational view of the physical training apparatus according to a second embodiment of the invention,

Fig. 9 is a perspective view of a physical training apparatus according to a third embodiment of the invention,

5 Fig. 10 is a side elevational view of a physical training apparatus according to a fourth embodiment of the invention,

Fig. 11 is a side elevational view of a physical training apparatus according to a fifth embodiment of the invention, and

10 Fig. 12 is a perspective view of the physical training apparatus shown in Fig. 11.

#### MODES FOR CARRYING OUT THE INVENTION

The physical training apparatus 10 shown in the drawings consists of a main frame 11, a moveable carriage 12, weight 13 and a cable 14 connected between the carriage 12 and the weight 13. The main frame 11 has a front portion 15 and a back portion 16 which collectively constitute the base of the main frame, and an upright portion 17 rearward of the front portion 15.

15 The upright portion 17 consists of a pair of spaced apart front upright posts 18 and a pair of spaced apart rear upright posts 19 connected together at their tops by longitudinal bars 20 which support a first pulley 21 adjacent the top of the rear posts 19 which extend upwardly from base supports 22.

20 A second pulley 23 is mounted adjacent the bottom of the rear posts 19 and a third pulley 24 is mounted at the front of the front portion 15 of the base. The carriage 12 travels along rails 25 and 26 mounted on pairs of uprights 27  
25 and 28 connected to the front portion 15 of the base by pairs of side members 29 and 30.

The carriage 12 consists of a pair of slide members 31 and 32 interconnected by a cross piece 33. The braced uprights 34 each carry a pad 35. Each slide member 31 and 32 has a pair of upper wheels 35 and a lower wheel 36 which engage the upper and lower faces of the rails 25 and 26.

5 At the front of the apparatus 10 there is a pair of foot rails 36, 37 mounted on adjustable rail 38 which projects forwardly from the front portion 15. The cable 14 extends from the weight 13 over the first pulley 21, around the second pulley 22, the third pulley 24 and is connected to the cross piece 33 of the carriage 12.

10 The front posts 18 support moveable quadrant 40 hinged at pivot point 41. Also hinged at this pivot point 41 are bars 42 which are pinned to the quadrant 40 through one of a number of holes 43 located around the rim of the quadrant 40. The weight 13 is mounted on an axle 44 which passes through the ends of the bars 42.

15 The end of cable 14 is secured to the base of the quadrant and extends around the groove perimeter of the quadrant 40 and up and over the pulley 21.

When an athlete pushes against the pads 35, the carriage 12 moves rearwardly in the direction of arrow A in Fig. 1 with the cable 14 raising the weight 13 to provide resistance to the driving pressure of the athlete.

20 Preferably, the athlete crouches and assumes the position with his back horizontal before pushing against the pads 35. The cables and pulleys convert the vertical resistance of the weight 13 into horizontal resistance against the driving force on the carriage.

As the quadrant section 40 and the attached weight 13 are raised, the 25 resistive torque increases in the same ratio as the moment arm from the axle 44 to the pivot point 41 is increasing. The effect of this is that the apparatus 10 provides less resistance in the range of motion where the relevant muscles can

apply less torque and more resistance where those muscles can exert greater torque.

The various placements of the bars 42 made possible by inserting pins in any one of holes 43 provide the athlete with a choice of resistive torque at  
5 the start of the exercise movement.

In this embodiment of the invention, the variable resistance is achieved by having the cable run around the periphery of the quadrant 40. In a modification of the invention, a cam of variable radius is used to provide specific variation of the resistive torque.

10 As indicated in Figs. 1 to 7, the carriage of this embodiment of the invention slides in a generally horizontal plane.

The second embodiment of the invention shown in Fig. 8 differs from the first embodiment of the invention in that it provides resistance in the vertical plane but also simulates the muscle contraction and extension provided by the  
15 squat exercise and provides for variable and increasing resistance as the athlete moves from deep contraction of the knee and hip joints to full extension of these joints.

As shown in Fig. 8, the apparatus 100 includes a mainframe 101 having a front portion 102 and a back portion 103 which has an upright portion 104. A  
20 vertically movable carriage 105 is mounted on upright 106 which constitutes part of the front portion 102. The carriage 105 carries a pad 106 and is connected to one end of a cable 107 which passes around the pulleys 108 and 109 and the periphery 110 of the quadrant 111. The other end of the cable 107 is secured to the lower part of the quadrant 111 as is the case with the first  
25 embodiment. A weight 112 is mounted on the free end of the bars 113 pivoted to the upright portion 104 about axis 114 in a similar fashion to the first embodiment of the invention.

The third and fourth embodiments of the invention shown in Figs. 9 and 10 provide resistance in the vertical plane and simulate the dynamic forces encountered in lifting and supporting jumpers in a rugby lineout. These embodiments of the invention provide for variable and increasing resistance as 5 the movable carriage is raised thereby simulating the decreasing momentum of the lineout jumper as he rises from the ground and the consequent need for the support player to bear an increasing load. These embodiments of the invention can be operated singularly or by two players simultaneously.

As shown in Fig. 9, the carriage 201 is vertically movable on uprights 10 202. The cable 203 extends from the bottom cross-bar 204 of the carriage 201 around pulleys 205, 206, 207 and 208. The other end 209 of cable 203 is anchored to the base 210. The pulley 208 is a floating pulley which is connected to one end of a second cable 211 and passes around pulley 212 and the periphery 213 of the quadrant 214 as before. The quadrant 214 pivots 15 about axis 215 as does subframe 216 which supports a weight (not shown) on axle 217.

The embodiment shown in Fig. 10 is substantially similar to that of Fig. 9 except that there is a different arrangement of the quadrant 214 and a simplified cable/pulley arrangement. Like numerals denote like components in 20 Figs. 9 and 10.

The fifth embodiment of the invention shown in Figs. 11 and 12 is a physical training machine which exercises and strengthens the muscles involved in flexing the knee and hip joints simultaneously and which provides for variable and decreasing resistance as the athlete moves from full extension 25 of the knee and hip joints to deep contraction of those joints.

As can be seen in Figs. 11 and 12, the carriage 300 is movable along inclined frame 301. The cable 302 extends from the carriage 300 around

pulleys 303 and 304 and its other end 305 is adjustably attached to adjustment bar 306 on the front leg of frame 301.

In this instance, the quadrant arm 307 is pivotally mounted on the crossbar 308 and the weight is carried by bar 309. Table 310 is mounted 5 above the rear portion of the apparatus and the carriage 300 has ankle rests 311 and foot engaging pads 312. The table 310 has hand grips 313 on each side.